

## REMARKS

In the present Office Action, claims 48, 69-70, 79 and 83 are objected to on the basis that they are not well defined because they are not the conventional dimension unit.

In addition, claims 43-47, 49 and 51-54 stand rejected under 35 U.S.C. § 103(a) over U.S. Pat. No. 5,482,248 to Connors, Jr. ("Connors, Jr") in view of U.S. Pat. App. No. 2004/0083926 to Mitkova et al. ("Mitkova").

In addition, claim 50 stands rejected under 35 U.S.C. § 103(a) over Connors, Jr. in view of Mitkova, and further in view of U.S. Pat. No. 4,581,068 to Schramm ("Schramm").

In addition, claims 48 and 79-82 are rejected under 35 U.S.C. § 103(a) over Connors, Jr. in view of U.S. Pat. No. 4,131,475 to Svec et al. ("Svec").

In addition, claims 55-60, 62, 64, 66 and 68 stand rejected under 35 U.S.C. § 103(a) over Mitkova in view of U.S. Pat. No. 5,147,830 to Banerjee et al. ("Banerjee").

Finally, claims 69, 70-76 and 83-86 stand rejected under 35 U.S.C. § 103(a) over Mitkova in view of Banerjee, and further in view of Svec.

Claims 48, 69-70 and 83 have been amended. Support for the amendment to claims 48 and 70 can be found at least at paragraph [0017] of the published application, U.S. Pat. App. No. 2005/0061471 (the '471 application).

**I. Objection to Claims 48, 69-70, 79 and 83**

As an initial matter, Applicants respectfully disagree with the objection that the "screen sizes 6X14, 14x70 and -70 are not well defined in the claims because they are not the conventional dimension unit such as millimeter or micron. Examiner cites no legal basis for this objection. Nevertheless, claims 48, 69-70 and 79 have been amended for the purposes of clarity.

**II. Rejections Under 35 U.S.C. § 103**

**A. Claims 43-47, 49 and 51-54 stand rejected under 35 U.S.C. § 103(a) over U.S. Pat. No. 5,482,248 to Connors, Jr. in view of U.S. Pat. App. No. 2004/0083926 to Mitkova et al.**

Claims 43-47, 49 and 51-54 are rejected under 35 U.S.C. § 103(a) over Connors, Jr. in view of Mitkova. However, the claims are not obvious because there is no teaching, suggestion, or motivation to combine the references. Furthermore, the claims are not obvious because common sense would not lead one of ordinary skill in the art based on the teachings of Connors, Jr. and Mitkova to arrive at the claimed compositions.

As set forth in *KSR v. Teleflex*, often it is necessary to look to interrelated teachings of multiple references; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the application at issue. *KSR v. Teleflex*, slip opinion, (U.S. 2007). Thus, it is appropriate to consider whether there is any teaching, suggestion, or motivation to combine the references in determine the obviousness of pending claims.

Furthermore,

[A] patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed invention does. *Id.*

In this case, there was no teaching, motivation, or suggestion to combine the references, and common sense would not render the pending claims obvious to one of ordinary skill in the art.

There is no teaching, suggestion, or motivation to combine Connors, Jr. with Mitkova because of how different the methods and materials of the two are relative to each other. The invention of Connors, Jr. is not directed to an investment mold at all. Connors, Jr. is directed to "a method of manufacturing open top, walled members such as troughs, runners, ladles and other vessels[.]" Connors, Jr. at col. 1, lines 13-14. Connors, Jr. does not mention any sort of investment casting or molding process.

Moreover, the materials used in Mitkova and Connors, Jr. are completely different. Connors, Jr. teaches a composition containing alumina and colloidal silica. Mitkova is directed to a "dry mix for an embedding or molding composition for a metal." Mitkova at paragraph [0006]. The dry mix of Mitkova contains a hydraulic binder. There would be no motivation to add a material used with a hydraulic binder to a material using alumina and colloidal silica. Connors, Jr. at col. 3, lines 59-61.<sup>1</sup> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990). Since Mitkova and Connors, Jr. teach completely different materials and completely different methods, there would be no motivation to combine the two references. Thus, because one skilled in the art would not be motivated to combine Connors, Jr. with Mitkova, claims 43-47, 49 and 51-54 are not obvious. Applicants respectfully request that the rejection be withdrawn.

Furthermore, common sense would not lead one to the claimed compositions for use in investment casting. The compositions of Connors, Jr. need to be easily pumped into a trough, runners, ladle or other vessel. Common sense would direct a skilled artisan focusing on applications such as those

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<sup>1</sup> Moreover, in Connors, Jr., the mold composition is used to support a mesh screen, Connors, Jr. at col. 2, lines 1-4, not to provide for precision casting.

described in Connors, Jr., and problems such as resiliency and flow properties, to include substances that would decrease the viscosity, not increase it. Connors, Jr. at col. 2, lines 12-13. One addressing the problems of Connors, Jr. would not add welan gum because welan gum provides "retention of viscosity at elevated temperatures." The '471 application at paragraph [0025].

The problems faced in Mitkova were likewise different than those faced by the inventors, and common sense would not have directed one working on the problems faced by Mitkova to develop the claimed compositions. Mitkova is directed to molding compositions comprising a sulfate-carrier-free hydrate hydraulic binder, such as Portland cement clinker. Mitkova at paragraph [0008]. Mitkova contemplates a number of superfine components. *Id.* at paragraphs [0038-0044]. With the components of Mitkova, it is possible, or at least more likely, for one of ordinary skill in the art to consider the use of microbial polysaccharides. However, common sense does not suggest using microbial polysaccharides, and in particular, welan gum, as claimed, for use with slurry composition comprising alumina and silica.

In addition, Connors, Jr. is not analogous art. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446 (Fed. Cir. 1992). The Office Action states that Connors, Jr. teaches [a] slurry composition (casting composition) for a mold. However, Connors Jr. is directed to "a method of manufacturing open top, walled members such as troughs, runners, ladles and other vessels[.]" Connors Jr. at col. 1, lines 13-14. In contrast, the pending application relates to a slurry composition for use in an investment casting process to make objects through investment casting via high quality, precision casting. 'The 471 application at paragraph [0004].

Not only are the two fields different, the problems presented by the two different processes require compositions with different properties. For example,

there is no mention in Connors, Jr. of including a polysaccharide thickener such as welan gum because Connors Jr. does not relate to precision casting. Thus, Connors Jr. is neither in the field of investment casting, nor is it reasonably pertinent to creating investment casting shells more quickly, efficiently, cheaply, or of higher quality. Therefore, Connors, Jr. is not analogous art, and claims 43-47, 49 and 51-54 are not obvious. Applicants respectfully request that the rejection be withdrawn. Thus, the claims are not obvious and applicants respectfully request that the rejection be withdrawn.

**B. Claim 50 stands rejected under 35 U.S.C. § 103(a) over Connors, Jr. in view of Mitkova, and further in view of U.S. Pat. No. 4,581,068 Schramm.**

Claim 50 stands rejected under 35 U.S.C. 103(a) as unpatentable over Connors, Jr. in view of Mitkova, and further in view of Schramm. For the same reasons described above for claims 43-49, 52-62, and 65-77, there is no suggestion or motivation to combine Connors, Jr with Mitkova. Therefore, claim 50 is not obvious. Applicants respectfully request that the rejection be withdrawn.

In addition, there is no motivation to combine Connors, Jr. with Mitkova and further with Schramm. According to the Office Action, "It would have been obvious to have one having ordinary skill in the art to provide Connors, Jr. in view of Mitkova et al the use of free carbon in the form of pitch or petroleum as taught by Schramm in order to substitute graphite and effectively reducing cost. However, there is no teaching or suggestion that substituting pitch would be suitable in the compositions as claimed and in an investment mold application.

Schramm is directed to feeding cupola furnaces in the melting of cast iron. Schramm at col. 1, lines 5-6. According to Schramm, free carbon, as "a calcined petroleum-, pitch-, or acicular coke or combination thereof," is added to a silicon carrier and a slag-forming material. *Id.* at col. 2, lines 9-13. The mixture is used to create an alloying material in a "shaped body", such as in the form of briquettes, to be added to a hot-blast cupola furnace with steel scrap proportions in excess of 30%, *Id.* at col. 1, line 67 – col. 2, line 2, to help prevent the "loss of

silicon from the silicon carrier." *Id.* at col. 2, lines 59-60. The materials described by Schramm are put in the slag zone of the hot blast cupola to reduce cupola loss. The materials of Schramm have nothing to do with any sort of investment casting, or any other type of casting. Thus, the compositions described by Schramm are extremely different from the compositions of the pending application because they would be used in entirely different ways. Accordingly, there is not teaching, suggestion, or motivation to combine the references and the claim is not obvious. Applicants respectfully request that the rejection be withdrawn.

Furthermore, it is clear from the discussion above that Schramm is not analogous art, and claim 50 is not obvious. Applicants respectfully request that the rejection be withdrawn.

**C. Claims 48 and 79-82 are rejected under 35 U.S.C. § 103(a) over Connors, Jr. in view of U.S. Pat. No. 4,131,475 to Svec et al.**

Claims 48 and 79-82 stand rejected under 35 U.S.C. 103(a) as unpatentable over Connors, Jr. in view of Mitkova, and further in view of Svec. However, Svec fails to cure any of the deficiencies of Connors, Jr. and Mitkova. The Office Action states that Svec "teaches the use of three different sizes of alumina in forming a slurry composition for the purposes of making molds[.]" OA at page 4.

However, claims 48 and 79-82 require three specific sizes of alumina, not simply three sizes of alumina. Svec, does not teach or suggest either the specific sizes required by Claims 40 and 79-82, nor the claimed weight percentages required by the claims. See table below.

Component	Particle Size of Mix #8 of Svec.	Svec % of alumina	Svec % range of entire composition <sup>2</sup>	Particle Size required by claims	Relevant claim language	Example 1, at para. [0027]
#1	240 mesh (50µm)	70%	56%–70%	screen size 6x14 (about 1100µm to about 3000µm)	about 0% to about 10%	4%

<sup>2</sup> Overall alumina comprises from 80% to 99.9% by weight of the total mold material after drying. Svec at col. 5, lines 40-41. Therefore, the % range of the composition of Mix #8 of Svec would necessarily vary between the amounts listed in the fourth column.

#2	320 mesh (31µm)	25%	20%~25%	screen size 14x70 (about 200 µm to about 1100µm)	about 40% to about 60%	46%
#3	400 mesh (22µm)	5%	4%~5%	screen size -70 (about 150µm)	about 2% to about 10%	6%

As can be seen from the table above, the particle sizes of the claimed compositions are significantly higher than the sizes taught by Svec. Also, as previously discussed with the Examiner in the phone interview, depending on the particle size distribution of the alumina, the investment casting mold may be either too weak or too strong. If it is too weak, the mold may break during the casting process. If it is too strong, it may be difficult to break the mold to remove the final cast item. Thus, the particle size distribution is important. None of the references of record disclose or suggest the claimed particle size

In addition, the compositions of Svec have high alumina to silica ratios: 80% to 99.9%. Svec at col. 5, lines 34-39. In contrast, the claimed compositions have a lower percentage of alumina relative to silica, taking into account the silicon carbide and colloidal silica. Thus, the particles sizes are different, and the component percentages by weight are different. Accordingly, Svec cures no deficiency of Connors, Jr. and Mitkova.

Also, for the same reasons described above for claims 43-49, 52-62, and 65-77, there is no suggestion or motivation to combine Connors, Jr with Mitkova, let alone combination with Svec. Therefore, claims 48 and 79-82 are not obvious. Applicants respectfully request that the rejections be withdrawn.

**D. Claims 55-60, 62, 64, 66 and 68 stand rejected under 35 U.S.C. § 103(a) over Mitkova in view of U.S. Pat. No. 5,147,830 to Banerjee et al.**

Claims 55-60, 62, 64, 66 and 68 are rejected under 35 U.S.C. § 103(a) over Mitkova in view of Banerjee. The Office Action states that Mitkova et al. "substantially teach the claimed lost wax casting method, comprising coating a wax pattern with a dry mix composition including binder, aggregates, carbon, setting agent, stabilizers and polypropylene fibers, wherein the aggregates include[e] alumina and silicon carbide and the stabilizers include[e]

polysaccharide gums such as welan gum." As acknowledged by the Office Action, Mitkova "fails to teach the use of slurry compositions including colloidal silica binder."

However, there is no teaching, suggestion, or motivation to combine a reference related to lost wax casting (Mitkova) with one related to methods of manufacturing, "troughs, runners, ladles, and other vessels which are used for containing and processing molten iron and steel" (Banerjee). Banerjee at col. 1, lines 16-17. The same deficiencies noted above for combining Connors, Jr. and Mitkova apply equally for Mitkova and Banerjee. Furthermore, common sense would not have led one of ordinary skill in the art to make the claimed compositions because the problems to be solved are different for precision lost wax casting compared to methods of making troughs, runners, ladles, and other vessels, as discussed above with regard to Connors, Jr.

In addition, and in the same way as Connors, Jr. was not analogous art, Banerjee is not analogous art because, like Connors, Jr., Banerjee is directed to a different field than investment casting. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1446 (Fed. Cir. 1992). Banerjee is directed to casting compositions for use with, and method of manufacturing, "troughs, runners, ladles, and other vessels which are used for containing and processing molten iron and steel." Banerjee at col. 1, lines 16-17.

**E. Claims 69, 70-76 and 83-86 stand rejected under 35 U.S.C. § 103(a) over Mitkova in view of Banerjee, and further in view of Svec.**

Claims 69, 70-76 and 83-86 are rejected under 35 U.S.C. § 103(a) over Mitkova in view of Banerjee and further in view of Svec. As discussed above, there is no teaching, suggestion, or motivation to combine Mitkova and Banerjee and common sense would not lead one of ordinary skill to the claimed compositions. In addition, as discussed above, Svec does not correct any of the

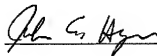


deficiencies of Mitkova and Banerjee, as Svec does not teach or suggest compositions including three sizes of alumina.

SUMMARY

Applicants believe the present application is now in condition for allowance. If the Examiner has any remaining issues, he is invited to contact the undersigned attorneys for the Applicants via telephone if such communication would expedite this application.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "John E. Haugen", is written over a horizontal line.

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